

Medical implications of controlled fasting

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J R Soc Med 1998;91:260–263

The custom of fasting is common to most Eastern and Western cultures and is widely practised. The reasons for fasting include health, protest and religious expressions of devotion, aestheticism and purification. Fasts can last from hours to months and can range from restricting certain foods to complete abstinence from all food and drink. Here I review the medical implications of controlled fasting in which food and drink is completely restricted from sunrise to sunset for consecutive days. This regimen has also been described as Ramadan-type fasting, partial fasting, restricted fasting, fasting–re-feeding, periodic food and water deprivation, and daily starvation–feeding. The Muslim fast of Ramadan, undertaken by about a billion people annually, is the most widely observed controlled fast today and has provided the setting for most of the research conducted.

BACKGROUND

Throughout recorded history fasting has been advocated for spiritual purification, as a safeguard against disturbing demonic influences and for the promotion of health. Fasting was practised by the ancient Egyptians, Greeks and Persians and is common to many world religions including Judaism, Christianity, Islam and the Baha'i Faith.

In ancient Greece, the belief that demons could enter the body through food contributed to the popularity of fasting and Pythagoras extolled its virtues¹. In the Old Testament, prophets practised fasting in preparation for religious experiences. For example, Elijah received a message from God after a forty-day fast. In Judaism only one day of fasting, Yom Kippur, was imposed by Mosaic law but four further days were added to commemorate disasters. Christ fasted for forty days in the wilderness; and, though he left no law on the subject, by the end of the fourth century a forty-day fast seems to have been standard practice during Lent². Originally, there were restrictions on the types of food permitted and only one daily meal was allowed. Punishments were dealt out to those who did not fast, ranging from exclusion from Easter celebrations to the knocking out of teeth and, in extreme cases, a death sentence³. But, by the fourteenth century, the fast had become a matter of just abstaining from animal products. According to classical Christianity, fasting was primarily an

act of penance with the secondary purpose of detaching believers from the things of this world, freeing them for the worship of God⁴.

Like some Christians, Muslims believe that fasting leads to the habit of self-control and the avoidance of sin and thereby ensures passage into the afterlife. It is regarded as an act of worship which confers great blessings and even improves health. The Muslim fast entails abstention from all substances entering the body from sunrise to sunset for one lunar month—the month of Ramadan. All Muslims above the age of puberty must fast, with exemptions for travellers, pregnant or breast-feeding women, menstruating women and people with serious illnesses. The month of Ramadan is calculated by the lunar calendar, therefore it lasts 28–30 days and shifts by 11 days each year, occurring at constantly varying periods. Consequently, in temperate regions, individuals may be without food and drink for up to 18 hours daily. Fluid and food intake becomes exclusively nocturnal; the dietary pattern changes to one large meal at sunset and one light meal before dawn, and the intake of carbohydrates rises⁵. Patterns differ, of course. Some people eat a high-caloric snack immediately after breaking their fast, with a larger meal an hour or two later and small tidbits throughout the night.

EFFECTS OF FASTING ON THE BODY

The effects of controlled fasting on the body can be classified according to physical adaptations (e.g. weight loss), metabolic adaptations (fuel stores, glucose), mineral changes (potassium, uric acid), hormonal changes (thyroid hormone, growth hormone), psychological effects, and medical complications.

The most extensive study on the effect of controlled fasting on body weight was in 137 Jordanian adults during Ramadan⁶. They were divided into three groups: overweight, normal weight (controls) and underweight. All three groups had a substantial reduction in weight, with the greatest loss in the overweight group. Four out of seven other studies confirm this observation^{7–13}. None of the investigators followed up the patients to see if the weight loss was sustained after Ramadan.

Eight studies have been conducted on the effect of Ramadan on blood cholesterol and triglycerides but the results of these are strongly conflicting; moreover, the

numbers of participants were small⁹⁻¹⁶. Serum uric acid levels increased in four studies^{7,15-17}. El-Hazmi demonstrated non-significant increases in total protein, calcium, sodium, potassium, and urea. These are all probably due to haemoconcentration¹⁷. Nomani reported that blood glucose concentrations were lower on the last day of fasting than on the first, although there were no signs of hypoglycaemia¹⁸. Blood cortisol and thyroid hormones were unaltered^{10,19,20}.

PHARMACOKINETICS

For those fasting during Ramadan the following formulations are not allowed: oral medications; injections; inhalers; ear and nose drops; suppositories. A substantial proportion of Muslim patients change their drug regimens during Ramadan without consulting their physicians, and there is potential for ill-effects if the timing of prescriptions is changed. Of 44 Muslim patients attending a hospital clinic in Nottingham, only 7 were prepared to take their medications during Ramadan as specified by the prescriber²¹. In a larger survey of 325 patients, over 60% changed the way in which they took their medication during the fasting period²². Toxic effects were found particularly in older patients who took their medications once in the day rather than at the prescribed intervals²³.

Pharmacokinetics and the mode of action of many drugs are substantially affected by the presence or absence of food in the alimentary canal. Large quantities of fluids consumed when the fast is broken can disrupt the dissolution of enteric coated preparations and alter the action of antibiotics such as erythromycin. Thus patients need to be advised on when and how to take prescribed drugs whilst fasting to minimize adverse effects and ensure therapeutic levels. For example, the half-life of short-acting drugs can be extended by use of slow-release preparations. Drugs with a longer half-life can also be used—e.g. atenolol in place of propranolol²³. However, drugs with a long half-life may need to be given for at least two weeks beforehand to produce a steady state concentration. Important patient groups are those with asthma, epilepsy, hypertension and psychiatric disorders.

DIABETES

Within the past decade diabetes has emerged as a major health issue in Islamic countries, with a prevalence of 3–5%. Often, patients with diabetes do not see themselves as having a serious illness and so observe the Ramadan fast. Health practitioners must then counsel them on how to fast without endangering their health. The usual concern is that fasting may precipitate hypoglycaemic episodes, when the patient is on medication. Hyperglycaemia with or without ketoacidosis can also be troublesome during fasting, through excessive eating when the fast is broken. Some patients arbitrarily reduce dosages or even stop taking their

medication completely. However, despite the theoretical hazards of fasting, in practice few complications seem to arise. In patients controlled on diet and oral hypoglycaemic agents alone, fasting may even prove beneficial through weight loss¹⁵ (Box 1).

Patients controlled on diet alone should endeavour to space meals equally over the non-fasting period, to avoid gorging and to make the pre-dawn meal the major meal of the day^{12,24}.

Patients on oral hypoglycaemic agents need to be advised on how to change their daily doses. The best strategy is probably to switch the morning dose (together with any midday dose) of a sulphonylurea with that taken at sunset^{12,24,25}. Patients on a single daily dose should take that dose unchanged with the first meal after sunset. The largest and most thorough study looked at 542 non-insulin-dependent diabetics treated with glibenclamide in Morocco²⁵. A randomized controlled trial of two regimens was conducted, with a comparison group of diabetics who chose not to fast. None of the laboratory values differed significantly between the three groups; nor was there a difference in the incidence of hypoglycaemia. The findings of this study suggest that glibenclamide was effective and safe for patients with non-insulin-dependent diabetes who fasted during Ramadan, other data support this interpretation^{11,24,26}.

In insulin-treated patients the safety of fasting during Ramadan must be carefully assessed since many require frequent snack meals to avoid hypoglycaemia. Home glucose monitoring and testing for ketones must be encouraged not only to prevent hypoglycaemia but also to prevent overeating^{24,27}. Those on twice-daily insulin should have half or a third of their usual dose of morning insulin, and after sunset they should have their usual evening dose before breaking the fast. It might be advisable to change those on a single daily dose of insulin to a twice-daily dose for the period of Ramadan. Fasting is not advised for

Box 1 Advice for diabetics during fasting

Diet-controlled

- Make the pre-dawn meal the major meal of the day
- Space meals equally over the non-fasting period

On sulphonylurea

- On single daily dose: take dose with the sunset meal
- On more than a once-daily regimen: switch the morning dose (plus any midday dose) with that taken at sunset

Insulin-treated

- Fasting not recommended in those prone to ketoacidosis or with wide swings in blood glucose
- On a single daily dose: change to twice daily dose
- On a twice daily dose: take half or one-third of morning insulin and take usual evening dose

patients who are prone to ketoacidosis or wide swings in blood glucose²⁴. After treating 800 Muslim diabetics over 10 years in Qatar, Davidson reported that he has seen only one hospital admission attributed to Ramadan—a young insulin-dependent diabetic in hypoglycaemic coma²⁶.

OTHER COMPLICATIONS

There are some reports of gastrointestinal complications during Ramadan. A five-year study in a busy Turkish hospital showed a significant increase in patients treated for peptic ulcer complications during Ramadan compared with the number in the period before²⁸. The most frequently encountered complication was upper gastrointestinal haemorrhage (77%), followed by peptic ulcer perforation. Some studies indicate that stomach acidity progresses almost linearly in people who have been left hungry²⁹. Benson reported a case of acute pancreatitis and massive gastric dilatation during Ramadan. He observes that, although this is known as 'Ramadan syndrome' by clinicians in Muslim countries, it is scantily documented³⁰. Dukes concluded that another hazard of Ramadan was primary small-bowel volvulus³¹. In 13 months amongst the Afghanistan Pushtoons, 73% of the 26 cases seen presented during Ramadan.

There are reports of other complications at the time of Ramadan. Ali showed that fasting reduced cognitive function and explained this in terms of physical fatigue¹. These results clearly have implications for long-distance drivers, people operating machinery, and the like. Accident and emergency attendances could be studied for such incidents but little research has been conducted. A study of road traffic accidents in Saudi Arabia showed a significant increase in the number of accidents during the period of Ramadan³². Langford examined the effect of fasting on accident and emergency attendances at a London hospital. The proportion of Muslims was 3.6% before and after Ramadan and 5.1% during Ramadan³³. An increased rate of accidents, especially in the afternoon, was observed during Ramadan in a survey of Islamic factory workers³⁴. The investigators concluded that those involved in heavy labour or exposed to heat could become severely dehydrated whilst fasting. They suggested: assignment to night shifts, relief from heavy or hot work by temporary assignment to less strenuous jobs, and encouragement to take vacations during Ramadan.

UNANSWERED QUESTIONS

Controlled fasting appears to be a poorly researched area. The response to fasting has not been investigated in populations such as the elderly, the sick and those involved in heavy physical labour. There are also times when Ramadan falls in mid-winter as well as mid-summer and

thus the effect of season on the body's response to fasting needs to be explored.

Historically, the regulation of food is one of the oldest forms of medicine, and even up to the 1950s fasting cures for all kinds of ill-health were propagated, especially in Germany³. There are many lay beliefs in Muslim countries about the health benefits of controlled fasting, for example, improving symptoms of arthritis and angina, and that male fertility increases during Ramadan. Apart from the weight benefits mentioned above there are no other studies into possible health benefits of controlled fasting. What are the long-term effects of fasting on blood cholesterol and triglycerides, and does this alter the incidence of heart disease or stroke? Does abstinence aid any addictions? Does it alter psychiatric morbidity? Daradkeh noted that parasuicides were low in Jordan during the month of Ramadan³⁵. This might be because all wrong-doing, including self-destructive behaviour, is prohibited and family contact is increased.

No study has yet been conducted of the symptoms experienced by people undertaking a controlled fast, and of how these symptoms change over the course of the fast. Work in primary care and in accident and emergency would shed light on these matters. Mosek conducted a study on headaches during the 25-hour fast of Yom Kippur³⁶ and showed that fasting was a strong headache precipitator, usually appearing after 16 hours; 8% of the participants, however, developed their headache 30–60 min after the meal that concluded the fast. Headache was especially likely to develop in regular tea or coffee drinkers.

Clinicians need to be aware of the medical consequences of controlled fasting and should discuss these issues with Muslim patients as the month of Ramadan approaches.

Acknowledgments I am grateful to Seena Fazel, Stephanie Cragg and Sharon Straus for their helpful comments.

REFERENCES

- 1 Ali MR, Amir T. Effects of fasting on visual flicker fusion. *Percept Mot Skills* 1989;69:627–31
- 2 *The Lenten Triodion*. Translated from the Greek by Mother Mary and Archimandrite Kallistos Ware. London: Faber & Faber, 1998
- 3 Vandereycken W, van Deth, R. *From Fasting Saints to Anorexic Girls—the History of Self-Starvation*. London: Athlone Press, 1994
- 4 Tamney JB. Fasting and dieting: a research note. *Rev Religious Res* 1986;27:255–62
- 5 Aslam M, Healy MA. Compliance and drug therapy in fasting Moslem patients. *J Clin Hosp Pharm* 1986;11:321–5
- 6 Takruri HR. Effect of fasting in Ramadan on body weight. *Saudi Med J* 1989;10:491–4
- 7 Nomani MZ, Hallak MH, Siddiqui IP. Effects of fasting on plasma uric acid and body weight in healthy men. *J Am Diet Assoc* 1990;90:1435–6

- 8 Husein R, Duncan M, Cheah S. Effects of fasting in Ramadan on Tropical Asiatic Moslems. *Br J Nutr* 1987;58:41-8
- 9 Hallak M, Nomani MZ. Body weight loss and changes in blood levels in normal men on hypocaloric diets during Ramadan fasting. *Am J Clin Nutr* 1988;48:1197-210
- 10 Fedail SS, Murphy D, Salih SY, Bolton CH, Harveyt RF. Changes in certain blood constituents during Ramadan. *Am J Clin Nutr* 1982;36:350-3
- 11 Mafauzy M, Zulkifli A, Wan Mohammed WB. A study of the fasting diabetic patients during the month of Ramadan. *Med J Malaya* 1990;45:14-17
- 12 Laajam MA. Ramadan fasting and non-insulin-dependent diabetes: Effect on metabolic control. *E Afr Med J* 1990;67:732-6
- 13 Shoukry M. Effect of fasting in Ramadan on plasma lipoproteins and apoproteins. *Saudi Med J* 1986;7:561-5
- 14 Maislos M, Khamaysi N, Abou-Rabiah Y. Marked increase in plasma high-density lipoprotein cholesterol after prolonged fasting during Ramadan. *Am J Clin Nutr* 1993;57:640-2
- 15 Al-Hader AF, Abu-Farsakh N, Khatib S. The effects of Ramadan fasting on certain biochemical parameters in normal subjects and in Type II diabetic patients. *Ann Saudi Med* 1994;14:139-41
- 16 Gumaa KA, Mustafa KY, Mahmoud NA. The effects of fasting in Ramadan: serum uric acid and lipid concentrations. *Br J Nutr* 1978;40:573-81
- 17 El-Hazimi M, Al-Faleh F. Effect of fasting on the values of haematological and biochemical parameters. *Saudi Med J* 1987;8:171-7
- 18 Nomani MZ, Hallak M, Siddiqui I. Changes in blood urea and glucose and their association with energy-containing nutrients in men on hypocaloric diets during Ramadan fasting. *Am J Clin Nutr* 1989;49:1141-5
- 19 Hadramy MS, Zawawi TH. Altered cortisol levels in relation to Ramadan. *Eur J Clin Nutr* 1988;42:359-62
- 20 Sajid KM, Akhtar M, Malik GO. Ramadan fasting and thyroid hormone profile. *J Pak Med Assoc* 1991;41:213-16
- 21 Aslam M, Healy MA. Drug regimens and fasting Moslem patients. *BMJ* 1985;290:71-2
- 22 Aslam M, Assad A. Drug regimens and fasting during Ramadan: a survey in Kuwait. *Publ Health* 1986;100:49-53
- 23 Aslam M, Wilson JV. Medicines, health and the fast of Ramadan. *J R Soc Health* 1992; (June);135-6
- 24 Sulimani RA, Famuyiwa FO, Laajam MA. Diabetes mellitus and Ramadan fasting: the need for a critical appraisal. *Diabetic Med* 1988;5:589-91
- 25 Belkhadir J, Ghomari H, Klocker N, Mikou A, Nasciri M, Sabri M. Muslims with non-insulin dependent diabetes fasting during Ramadan: treatment with glibenclamide. *BMJ* 1993;307:292-5
- 26 Davidson JC. Muslims, Ramadan, and diabetes mellitus. *BMJ* 1979;2:1511-12
- 27 Ebbing RN. Muslims, Ramadan and diabetes mellitus. *BMJ* 1979;2:333-4
- 28 Donderici O, Temizhan A, Kucukbas T, Eskioglu E. Effect of Ramadan on peptic ulcer complications. *Scand J Gastroenterol* 1994;29: 603-6
- 29 Lanzon-Miller S, Pounder RE. The effect of fasting on 24-hour intragastric acidity and plasma gastrin concentration. *Am J Gastroenterol* 1991;86:165-7
- 30 Benson JR, Ward MP. Massive gastric dilatation and acute pancreatitis—a case of the Ramadan syndrome. *Letter. Postgrad Med J* 1992;62:689
- 31 Editorial. An Islamic twist. *Lancet* 1977;11:232
- 32 Shanks NJ, Ansari M, al-Kalai D. Road traffic accidents in Saudi Arabia. *Publ Health* 1994;108:27-34
- 33 Langford EJ, Ishaque MA, Fothergill J, Touquet R. The effect of Ramadan on accident and emergency attendances. *J R Soc Med* 1994;87:517-18
- 34 Schmahl FW, Metzler B. The health risks of occupational stress in Islamic industrial workers during the Ramadan fasting period. *Pol J Occup Med* 1991;4:219-28
- 35 Daradkeh TK. Parasuicide during Ramadan in Jordan. *Acta Psychiatr Scand* 1992;86:253-4
- 36 Mosek A, Korczyn AD. Yom Kippur headache. *Neurology* 1995;45:1953-5